

What is claimed is:

1. A photochemical hole burning medium, comprising a material in which a rare earth complex and a reducing agent dispersed in a solid matrix.
2. The photochemical hole burning medium set forth in claim 1, wherein said rare earth complex is at least one complex selected from the group consisting of a europium (III) crown ether complex, a europium (III) polyether complex, and a europium (III) cryptand complex.
3. The photochemical hole burning medium set forth in claim 1 or 2, wherein said rare earth complex and said reducing agent constitute an electron-donating composite compound.
4. The photochemical hole burning medium set forth in claim 3, wherein said electron-donating composite compound is a silane compound or a disilazane compound.
5. The photochemical hole burning medium set forth in claim 4, wherein said silane compound or the disilazane compound is a hexaalkyl disilazane represented by hexamethyl disilane or a hexaalkyldisilazane represented by hexamethyldisilazane.
6. The photochemical hole burning medium set forth in claim 3, wherein said electron-donating composite compound is an organic tin compound.
7. The photochemical hole burning medium set forth in claim 4, wherein said electron-donating composite compound is an organic tin compound.
8. The photochemical hole burning medium set forth in claim 5, wherein said electron-donating composite compound is an organic tin compound.
9. The photochemical hole burning medium set forth in claim 6, wherein said organic tin compound is a compound represented by  $\text{RSnSnR}$  in which R is an alkyl group or an aryl group.
10. The photochemical hole burning medium set forth in claim 7, wherein said organic tin compound is a compound represented by  $\text{RSnSnR}$  in which R is an alkyl group or an aryl group.
11. The photochemical hole burning medium set forth in claim 8, wherein said organic tin compound is a compound represented by  $\text{RSnSnR}$  in which R is an alkyl group or an aryl group.
12. The photochemical hole burning medium set forth in claim 1 or 2,

wherein said solid matrix is at least one glass-forming compound selected from the group consisting of silica, germanium oxide, boron oxide, phosphorus pentaoxide and tellurium oxide.

13. The photochemical hole burning medium set forth in claim 3, wherein said solid matrix is at least one glass-forming compound selected from the group consisting of silica, germanium oxide, boron oxide, phosphorus pentaoxide and tellurium oxide.

14. The photochemical hole burning medium set forth in claim 4, wherein said solid matrix is at least one glass-forming compound selected from the group consisting of silica, germanium oxide, boron oxide, phosphorus pentaoxide and tellurium oxide.

15. The photochemical hole burning medium set forth in claim 5, wherein said solid matrix is at least one glass-forming compound selected from the group consisting of silica, germanium oxide, boron oxide, phosphorus pentaoxide and tellurium oxide.

16. The photochemical hole burning medium set forth in claim 6, wherein said solid matrix is at least one glass-forming compound selected from the group consisting of silica, germanium oxide, boron oxide, phosphorus pentaoxide and tellurium oxide.

17. The photochemical hole burning medium set forth in claim 7, wherein said solid matrix is at least one glass-forming compound selected from the group consisting of silica, germanium oxide, boron oxide, phosphorus pentaoxide and tellurium oxide.

18. The photochemical hole burning medium set forth in claim 8, wherein said solid matrix is at least one glass-forming compound selected from the group consisting of silica, germanium oxide, boron oxide, phosphorus pentaoxide and tellurium oxide.

19. The photochemical hole burning medium set forth in claim 9, wherein said solid matrix is at least one glass-forming compound selected from the group consisting of silica, germanium oxide, boron oxide, phosphorus pentaoxide and tellurium oxide.

20. The photochemical hole burning medium set forth in claim 10, wherein said solid matrix is at least one glass-forming compound selected from the group

consisting of silica, germanium oxide, boron oxide, phosphorus pentaoxide and tellurium oxide.

21. The photochemical hole burning medium set forth in claim 11, wherein said solid matrix is at least one glass-forming compound selected from the group consisting of silica, germanium oxide, boron oxide, phosphorus pentaoxide and tellurium oxide.

22. The photochemical hole burning medium set forth in claim 12, wherein at least one compound selected from the group consisting of  $\text{Al}_2\text{O}_3$ ,  $\text{Ga}_2\text{O}_3$ ,  $\text{In}_2\text{O}_3$ ,  $\text{TiO}_2$ ,  $\text{ZrO}_2$ ,  $\text{Nb}_2\text{O}_5$  and  $\text{Ta}_2\text{O}_5$  is contained in said solid matrix.

23. The photochemical hole burning medium set forth in claim 13, wherein at least one compound selected from the group consisting of  $\text{Al}_2\text{O}_3$ ,  $\text{Ga}_2\text{O}_3$ ,  $\text{In}_2\text{O}_3$ ,  $\text{TiO}_2$ ,  $\text{ZrO}_2$ ,  $\text{Nb}_2\text{O}_5$  and  $\text{Ta}_2\text{O}_5$  is contained in said solid matrix.

24. The photochemical hole burning medium set forth in claim 14, wherein at least one compound selected from the group consisting of  $\text{Al}_2\text{O}_3$ ,  $\text{Ga}_2\text{O}_3$ ,  $\text{In}_2\text{O}_3$ ,  $\text{TiO}_2$ ,  $\text{ZrO}_2$ ,  $\text{Nb}_2\text{O}_5$  and  $\text{Ta}_2\text{O}_5$  is contained in said solid matrix.

25. The photochemical hole burning medium set forth in claim 15, wherein at least one compound selected from the group consisting of  $\text{Al}_2\text{O}_3$ ,  $\text{Ga}_2\text{O}_3$ ,  $\text{In}_2\text{O}_3$ ,  $\text{TiO}_2$ ,  $\text{ZrO}_2$ ,  $\text{Nb}_2\text{O}_5$  and  $\text{Ta}_2\text{O}_5$  is contained in said solid matrix.

26. The photochemical hole burning medium set forth in claim 16, wherein at least one compound selected from the group consisting of  $\text{Al}_2\text{O}_3$ ,  $\text{Ga}_2\text{O}_3$ ,  $\text{In}_2\text{O}_3$ ,  $\text{TiO}_2$ ,  $\text{ZrO}_2$ ,  $\text{Nb}_2\text{O}_5$  and  $\text{Ta}_2\text{O}_5$  is contained in said solid matrix.

27. The photochemical hole burning medium set forth in claim 17, wherein at least one compound selected from the group consisting of  $\text{Al}_2\text{O}_3$ ,  $\text{Ga}_2\text{O}_3$ ,  $\text{In}_2\text{O}_3$ ,  $\text{TiO}_2$ ,  $\text{ZrO}_2$ ,  $\text{Nb}_2\text{O}_5$  and  $\text{Ta}_2\text{O}_5$  is contained in said solid matrix.

28. The photochemical hole burning medium set forth in claim 18, wherein at least one compound selected from the group consisting of  $\text{Al}_2\text{O}_3$ ,  $\text{Ga}_2\text{O}_3$ ,  $\text{In}_2\text{O}_3$ ,  $\text{TiO}_2$ ,  $\text{ZrO}_2$ ,  $\text{Nb}_2\text{O}_5$  and  $\text{Ta}_2\text{O}_5$  is contained in said solid matrix.

29. The photochemical hole burning medium set forth in claim 19, wherein at least one compound selected from the group consisting of  $\text{Al}_2\text{O}_3$ ,  $\text{Ga}_2\text{O}_3$ ,  $\text{In}_2\text{O}_3$ ,  $\text{TiO}_2$ ,  $\text{ZrO}_2$ ,  $\text{Nb}_2\text{O}_5$  and  $\text{Ta}_2\text{O}_5$  is contained in said solid matrix.

30. The photochemical hole burning medium set forth in claim 20, wherein at least one compound selected from the group consisting of  $\text{Al}_2\text{O}_3$ ,  $\text{Ga}_2\text{O}_3$ ,  $\text{In}_2\text{O}_3$ ,  $\text{TiO}_2$ ,  $\text{ZrO}_2$ ,  $\text{Nb}_2\text{O}_5$  and  $\text{Ta}_2\text{O}_5$  is contained in said solid matrix.

31. The photochemical hole burning medium set forth in claim 21, wherein at least one compound selected from the group consisting of  $\text{Al}_2\text{O}_3$ ,  $\text{Ga}_2\text{O}_3$ ,  $\text{In}_2\text{O}_3$ ,  $\text{TiO}_2$ ,  $\text{ZrO}_2$ ,  $\text{Nb}_2\text{O}_5$  and  $\text{Ta}_2\text{O}_5$  is contained in said solid matrix.

32. The photochemical hole burning medium set forth in claim 1, wherein the reducing agent has an oxidation/reduction potential of not more than 1 V.

33. The photochemical hole burning medium set forth in claim 2, wherein the reducing agent has an oxidation/reduction potential of not more than 1 V.

34. The photochemical hole burning medium set forth in claim 3, wherein the reducing agent has an oxidation/reduction potential of not more than 1 V.

35. The photochemical hole burning medium set forth in claim 4, wherein the reducing agent has an oxidation/reduction potential of not more than 1 V.

36. The photochemical hole burning medium set forth in claim 5, wherein the reducing agent has an oxidation/reduction potential of not more than 1 V.

37. The photochemical hole burning medium set forth in claim 6, wherein the reducing agent has an oxidation/reduction potential of not more than 1 V.

38. The photochemical hole burning medium set forth in claim 7, wherein the reducing agent has an oxidation/reduction potential of not more than 1 V.

39. The photochemical hole burning medium set forth in claim 8, wherein the reducing agent has an oxidation/reduction potential of not more than 1 V.

40. The photochemical hole burning medium set forth in claim 9, wherein the reducing agent has an oxidation/reduction potential of not more than 1 V.

41. The photochemical hole burning medium set forth in claim 10, wherein the reducing agent has an oxidation/reduction potential of not more than 1 V.

42. The photochemical hole burning medium set forth in claim 11, wherein the reducing agent has an oxidation/reduction potential of not more than 1 V.